



PART 1. Revise the 1997 Phoenix Fire Code by adding a Section 1008 titled “Firefighter Air Systems” that reads as follows:

1008 Firefighter Air System

1008.1 Scope. The design, installation, and maintenance of firefighter air systems shall be in accordance with this section.

1008.2 Required Installations. A firefighter air system shall be installed in the following buildings:

1. Buildings classified as high-rise in accordance with this Code.
2. Underground structures that are two or more floors below grade with an area greater than 10,000 square feet.

1008.3 Permits, Plans and Fees.

1008.3.1 Permits. A permit is required to install or modify a firefighter air system.

1008.3.2 Plans. Prior to the installation of a firefighter air system, a minimum of two sets of plans and specifications shall be submitted to the Fire Department for review and approval. Plans shall demonstrate compliance with the requirements of this section and shall include calculations prepared by a registered professional engineer demonstrating that the design criteria for all pressure containing components is satisfied plus a minimum safety factor of 25%.

The plans submittal shall also include specifications for the tubing, fittings, and manufacturer data sheets for valves, pressure regulators, pressure relief devices, gauges, RIC universal air connections and cylinder filling hoses.

1008.3.3 Contractor Qualification. The firefighter air system shall be installed by Arizona state licensed contractors that possess a rescue air system - commercial, residential, or dual license. Proof of licensure shall be provided with the plan submittal.

1008.3.4 Fees. Fees shall be paid to the Fire Department at time of plan submittal. See Appendix B.

1008.4 Design Criteria.

1008.4.1 The system shall be designed to fill, at each interior cylinder filling panel one 66 standard cubic foot compressed breathing air cylinder to a maximum pressure of 4,500 PSIG.

1008.4.2 The filling operation shall be completed in not more than two minutes upon connection of the cylinder to the fill hose.

1008.4.3 The minimum design flow of the breathing air piping system shall be calculated using two interior cylinder filling panels operating simultaneously and located at the highest level above the fire department access.

1008.5 Operating Pressure. All components used in the system shall be rated to operate at a minimum pressure of 5,000 PSIG at 70 F.



1008.6 Marking. System piping, gauges, valves and air outlets shall be clearly marked by means of steel or plastic labels or tags indicating their function. Markings used for piping systems shall consist of the content's name and include a direction of flow arrow. Markings shall be provided at each valve; at wall, floor or ceiling penetrations; at each change of direction; and at a minimum of every 20 feet or fraction thereof throughout the piping system.

1008.7 Exterior Fire Department Connection Panel and Enclosure.

1008.7.1 Location. A fire department connection panel shall be attached to the building or on a remote monument at the exterior of the building. The panel shall be secured inside of a weather resistant enclosure. The panel shall be within 50 feet of an approved roadway or driveway, or other location approved by the Fire Department. The enclosure shall be visible and accessible on approach to the building.

1008.7.2 Construction. The fire department connection panel shall be installed in a cabinet constructed of minimum 18-gauge carbon steel. When constructed of steel, the cabinet shall be provided with coating to protect the cabinet from corrosion. When the enclosure is constructed of non-metallic materials, the enclosure shall be resistant to ultraviolet and infrared solar radiation.

1008.7.3 Vehicle Protection. When the panel is located in an area subject to vehicle traffic, impact protection shall be provided in accordance with this Code.

1008.7.4 Enclosure Marking. The front of the enclosure shall be marked "FIREFIGHTER AIR SYSTEM" on securely attached steel, plastic engraved or painted plate. The lettering shall be in a color that contrasts with the enclosure front and in letters that are a minimum of 2 inches high with 3/8-inch brush stroke. The marking of the enclosure shall be visible.

1008.7.5 Enclosure Components. The enclosure shall house a fire department connection panel containing the following components:

1. One - Male RIC UAC fitting. When connected to a female fitting, the assembled UAC shall meet the construction, performance and dimensional requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services 2002 Edition*.
2. Two - Liquid filled pressure gauges. The face of the pressure gauge shall be a minimum 2.5-inch diameter. The gage shall have a pressure range of 0-10,000 PSIG and indicating units shall not be less than 100 PSIG or greater than 250 PSIG increments. One pressure gauge shall be provided and marked to indicate the fill pressure. One pressure gauge shall be provided and marked to indicate the system pressure.
3. One – Pressure Regulator. One pressure regulator shall be installed between the RIC UAC fitting and the safety relief valve. The set pressure of the regulator shall not exceed the inlet pressure specified for the male RIC UAC fitting.
4. One – Spring-loaded safety relief valve. A spring-loaded safety relief valve installed downstream of the pressure regulator inlet. The relief valve shall meet the requirements of the *ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels*, and shall not be field adjustable. The relief valve shall have a set to open pressure not exceeding 1.1 times the design pressure of the system.
5. One – Shutoff Valve. The valve shall be installed upstream of the male RIC UAC connection and check valve.
6. One – Check Valve. The check valve shall be installed between the male RIC UAC connection and the shutoff valve.
7. Tubing, fittings, adapters and supports as required.



1008.7.6 Security. To prevent unauthorized access to or tampering with the system, the fire department connection panel enclosure shall be maintained locked by an approved means.

1008.8 Interior Cylinder Fill Panels and Enclosure.

1008.8.1 Location. Cylinder fill panels shall be installed in the interior of buildings as follows:

1. High Rise Buildings. An interior cylinder fill panel and enclosure shall be installed adjacent to standpipe outlets in stairwells of high rise buildings commencing on the second floor above grade and below grade and every other floor thereafter.
2. Underground Structures. An interior cylinder fill panel and enclosure shall be installed in stairwells on the second level below grade and every other below grade level thereafter.

The panel shall be located a minimum of 36 inches but not more than 60 inches above the finished floor or a stairway landing.

1008.8.2 Cabinet Requirements. Each cylinder fill panel shall be installed in a cabinet constructed of minimum 18-gauge carbon steel. The depth of the cabinet shall not create an exit obstruction when installed in building stairways. With the exception of the shutoff valve, pressure gauges, fill hoses and ancillary components, no system components shall be visible and shall be contained behind a minimum 18-gauge interior panel.

1008.8.3 Door. Hinges for the cabinet door shall be located inside of the cabinet. The door shall be arranged such that when the door is open, it does not reduce the required exit width or create an obstruction in the path of egress. A minimum of 80% of the door surface area shall be constructed of tempered glass. The thickness of the glass shall not be greater than 1/8-inch.

1008.8.4 Cabinet Marking. The front of each cylinder fill panel shall be marked "FIREFIGHTER AIR SYSTEM". The lettering shall be in a color that contrasts with the cabinet front and in letters that are a minimum of 2-inches high with 3/8-inch brush stroke. The marking of the cabinet shall be visible to emergency response personnel.

1008.8.5 Cabinet Components. The cabinet shall be of sufficient size to allow for the installation of the following components:

1. One – shutoff valve located between the cylinder fill panel and the main compressed air riser. It is permissible to locate this shutoff valve outside of the cylinder fill panel.
2. Two - Liquid filled pressure gauges. The face of the pressure gauge shall be a minimum 2.5-inch diameter. The gage shall have a pressure range of 0-10,000 PSIG and indicating units shall not be less than 100 PSIG or greater than 250 PSIG increments. One pressure gauge shall be provided and marked to indicate the fill pressure on the 3,000 PSIG fill connection. One pressure gauge shall be provided and marked to indicate the fill pressure on the 4,500 PSIG connection.
3. One – pressure regulator. One regulator shall be installed between the safety relief valve and the 3,000 PSIG fill connection. The set pressure of the regulator shall not exceed the discharge pressure specified for the RIC UAC fitting.
4. One – Spring-loaded safety relief valve. A spring-loaded safety relief valve shall be installed downstream of the 3,000 PSIG pressure regulator inlet. The relief valve shall meet the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, and shall not be field adjustable. The relief valve shall have a set to open pressure not exceeding 1.1 times the design pressure of the system.
5. Two - 4,500 PSIG SCBA fill hoses with RIC UAC fittings.
6. Two - 3,000 PSIG SCBA fill hoses with RIC UAC fittings.



7. Tubing, fittings, adapters and supports as required.

1008.8.6 Cylinder Filling Hose. The design of the cabinet shall provide a means for storing the hose to prevent kinking. When the hose is coiled, the brackets shall be installed so that the hose bend radius is maintained at 4 inches or greater.

The discharge outlet of each cylinder filling hose shall have a female RIC UAC. The female fitting shall be designed to connect to a male RIC UAC. The assembled RIC UAC shall meet the construction, performance and dimensional requirements of NFPA 1981, *Standard on Open Circuit Self-Contained Apparatus for Fire and Emergency Services*, 2002 Edition, Section 6.4.

1008.8.7 Security. To prevent unauthorized access to or tampering with the system, each panel cover shall be maintained locked by an approved means.

1008.9 Installation of Components.

1008.9.1 Pressure monitoring switch. An electric low pressure monitoring switch shall be installed in the piping system to monitor the air pressure. The pressure switch shall be connected to the building's fire alarm system. The pressure switch shall transmit a supervisory signal when the pressure of the breathing air system is less than 3,000 PSIG at 70 F, + 100 PSIG. If the building is not equipped with a fire alarm system, activation of the pressure switch shall activate an audible alarm located at the building's main entrance. A weather resistant sign shall be provided adjacent to the audible alarm stating "FIREFIGHTER AIR SYSTEM – LOW AIR PRESSURE ALARM." The lettering shall be in a contrasting color and the letters shall be a minimum of 2 inches high with 3/8-inch brush stroke.

1008.9.2 Tubing. Piping shall be constructed of stainless steel or other approved materials that are compatible with breathing air. The use of nonmetallic materials shall be compatible with breathing air. When stainless steel tubing is used, it shall meet ASTM A-269, Grade 316 or an equal standard. Stainless steel fitting shall be a minimum .375 outside diameter x .065 wall 316 fully annealed seamless. Stainless steel fittings shall be at least Grade 316 and meet the requirements of ASTM A-479 or equal. Routing of tubing and bends shall be such as to protect the tubing from mechanical damage.

1008.9.3 Support Piping shall be supported at maximum intervals of five (5) feet. Individual tubing clamps and mounting components shall be mechanically secured to the building support-members in accordance with manufacturers specifications.

1008.9.4 Fittings. Fittings shall be constructed of stainless steel or other approved materials that are compatible with breathing air. The use of nonmetallic materials shall be compatible with breathing air. Stainless steel fitting shall be at least Grade 316 and meet the requirements of ASTM A-479 or an equal standard.

1008.9.5 Prohibition. The use of carbon steel, iron pipe, malleable iron, high strength gray iron, or alloy steel is prohibited.

1008.10 System Assembly Requirements. The system shall be all welded system except where the tubing joints are readily accessible and at the individual air fill panels. When mechanical high-pressure tube fittings are used, they shall be approved for the type of materials to be joined and rated for the maximum pressure of the system.

Welding procedures shall meet ASME B31.1-1989, Part 4 and Chapter V (Exhibit VI). Prior to and during the welding of sections of tubing, a continuous, regulated dry nitrogen or argon purge at three PSIG shall be maintained to eliminate contamination with products of the oxidation or welding flux. The purge shall



commence a minimum of 2 minutes prior to welding operations and continue until the welded joint is at ambient temperature (60 - 80°F).

1008.11 Prevention of Contamination. The installing contractor shall ensure that, at all times, the system components are not exposed to contaminants, including but not limited to, oils, solvents, dirt and construction materials. When contamination of system components has occurred, the affected component shall not be installed in the system.

1008.12 Testing and Inspection.

1008.12.1 Testing. Following fabrication, assembly, and installation of the piping distribution system, exterior connection panel and interior cylinder fill panels, the Fire Department shall witness the pneumatic testing of the complete system at a minimum test pressure of 5,500 PSI using oil free dry air, nitrogen or argon. A minimum 24 hour pneumatic or hydrostatic test shall be performed. During this test all fittings, joints and system components shall be inspected for leaks. A solution compatible with the system component materials shall be used on each joint and fitting. Any defects in the system or leaks detected shall be documented on an inspection report, repaired or replaced. As an alternate, a pressure decay test in accordance with ASME B31.3 is allowed.

A test of the low pressure monitoring switch shall be performed.

Each air fill panel shall be tested for compatibility with the fire department's SCBA RIC UAC.

The pipe or tubing manufacturer mill report shall be provided to the Fire Department.

1008.12.2 A minimum of two samples shall be taken from separate air fill panels and submitted to an independent certified gas analysis laboratory to verify the system's cleanliness and that the air is certified as breathing air. The laboratory shall submit a written report of the analysis to the Fire Department documenting that the breathing air complies with this section.

1008.12.3 During the period of air quality analysis, the air fill panel inlet shall be secured so that no air can be introduced into the system and each air fill panel shall be provided with a sign stating "AIR QUALITY ANALYSIS IN PROGRESS, DO NOT FILL OR USE ANY AIR FROM THIS SYSTEM." This sign shall be a minimum of 8-1/2 X 11" with minimum of 1" lettering.

1008.12.4 Inspection. Annually, the breathing air within the system shall be inspected in accordance with this section.

At least quarterly one air sample shall be taken and certified as breathing air in accordance with the section. The laboratory test results shall be maintained available for review by the Fire Department.

1008.13 System Acceptance and Certification

Prior to the final acceptance of the air system, the building owner shall provide for the testing and certification of the system. As a minimum, this shall include: verifying the system's compatibility with the fire department's SCBA apparatus, the system's ability to maintain 5,000 PSI working pressure, the operability of the low pressure monitoring switch and that the system's air quality complies with the requirements of section 1008.12. Prior to final acceptance, the building owner shall provide the Fire Department with written verification of a testing and certification contract.

Upon satisfactory completion of all tests and verification of air quality, the system shall be considered complete.



1008.14 Modifications

Plans shall be submitted to the Fire Department prior to performing any modification or changes to a firefighter air system.

PART 2. Revise the 1997 Phoenix Fire Code by adding a new definition to Section 203 that reads as follows:

Breathing Air is oxygen or a respirable gas mixture stored in a compressed state and supplied to the user in gaseous form. It is a minimum air quality of Grade D as specified in ANSI/CGA G-7.1, *Commodity Specifications for Air*, and shall have a water content not exceeding 24 parts per million by volume and shall have a maximum particulate level of 5 milligram per cubic meter in air.

PART 3. Revise the 1997 Phoenix Fire Code by adding a new definition to Section 207 that reads as follows:

Fire Department Breathing Air System is a piping network and associated components installed in building stairwells or other approved locations that is designed to deliver breathing air to firefighters supplied from fire department apparatus that use a connection located outside of a building.

PART 4. Revise the 1997 Phoenix Fire Code by adding a new definition to Section 219 that reads as follows:

Rapid Intervention Crew Universal Air Connection (RIC UAC). A connection that allows emergency replenishment of breathing air to the self-contained breathing apparatus of fire or emergency services personnel.

PART 5. Revise the 1997 Phoenix Fire Code by adding a new permit in Section 105.8 that reads as follows:

b.3 Breathing Air System. To install or modify a firefighter air system. See Article 10.

PART 6. Revise Appendix B, Fees, of the Phoenix Fire Code by adding a new permit fee for Firefighter Air Systems that reads as follows:

<u>Firefighter Breathing Air System Installation</u>	<u>\$875.00</u>
<u>Firefighter Breathing Air System Installation</u>	<u>\$400.00</u>